Quarterly Report

(for July - September 1996)

Funding Document Number S-41385-F

Correction of Thin Cirrus Effects and Characterization of Cirrus Radiative Properties From EOS/MODIS Data

Bo-Cai Gao
Naval Research Laboratory
Remote Sensing Division, Code 7212
4555 Overlook Avenue, SW
Washington, DC, 20375

Submitted November 14, 1996

The focus of the proposed research is to develop new techniques using visible, near-IR, and IR channels for correction of thin cirrus cloud effects and for characterization of cirrus radiative properties from imaging data acquired with the Moderate Resolution Imaging SpectroRadiometer (MODIS) on the EOS Platforms. The specific objectives include:

(a) developing an operational algorithm for removing thin cirrus effects from MODIS images in the 0.4-0.7 micron region over the ocean. This algorithm will be incorporated into the present MODIS atmospheric correction algorithm for ocean color applications, and will yield improved retrieval of water leaving radiances and aerosol optical depths over oceanic areas;

(b) developing an operational algorithm for removing thin cirrus effects from MODIS images over land in the 0.4 - 1.0 micron spectral region. The incorporation of this algorithm into other MODIS land algorithms is expected to yield improved retrieval of land surface data products and aerosol optical depths.

The principle investigator is Bo-Cai Gao of Naval Research Laboratory. Co-investigators include Warren Wiscombe of NASA Goddard Space Flight Center, and Michael Mishchenko of NASA/GISS (through SUNY).

This is the first quarter that NASA funds were provided to NRL. Warren Wiscombe and Michael Mishchenko basically didn't receive funds during this quarter. There was only small progress with the proposed algorithm development. Anyway, I will make an attempt to report the progress and the plan for the next quarter (October - December, 1996).

Progress made during the 3rd quarter of 1996:

(a) After going through extensive searching process, Dr. Wei Han was hired through an NRL contracting company (SFA) to work at NRL and to help with image processing and algorithm development. Dr. Han started to work on September 9, 1996, and is getting familiar with the new job.

(b) A sub-contract between NRL and SUNY was arranged to transfer funds to Michael Mishchenko. With help from the Office of Remote Sensing Division of NRL and considerable amount of efforts from Bo-Cai Gao, the sub-contract was set up near the end of September, and about $20K was transferred to SUNY. If the sub-contract was set up after September 30 of 1996, NRL would impose a surcharge to funds transferred out of NRL. Fortunately, we avoided the surcharge.

(c) Bo-Cai Gao, Michael Mishchenko, and Anthony Davis (a representative of Warren Wiscombe) participated the MODIS Atmospheric Group Meeting held in July near Wallops Island. Mishchenko described algorithms for calculating non-spherical ice-particle phase functions. Davis described his work with multi-fractals.

(d) The main customers of our cirrus correction products are Howard Gordon (for ocean color) and Eric Vermote (for land reflectance products). Bo-Cai Gao spoke with them to make sure that the cirrus correction algorithm to be developed and the output products can be incorporated into their data processing streams.

Plans for the 4th quarter of 1996:

(a) Will develop the I/O routines and the most simple cirrus correction algorithm. Richard Hucek of MODIS SDST and Allen Chu of Yoram Kaufman's group will help with the I/O routine development. The I/O routines will be obtained through simple modifications to the present MODIS near-IR water vapor algorithm.

(b) Will set up a cirrus reflectance threshold above which no attempt will be made for the correction of cirrus effects. This will be done through analysis of existing high resolution spectral imaging data (AVIRIS and MAS).

(b) Will develop a strategy to model cirrus radiative properties. Michael Mishchenko will start to develop a set of ice particle size distributions and to calculate the phase functions for relevant MODIS channels. K.-N. Liou's research group also offered to help with the phase function calculations. Anthony Davis (working for Warren Wiscombe) will start the development of a Monte-Carlo radiative transfer code. This code will be used for sensitivity studies.